

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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SUBJECT Graduation of Theodolite Scales,
Arsenal No. 1, Kiev

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THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

25X1 1. A team from Zeiss, Jena, working at Arsenal No. 1, Kiev, was engaged in the production of various optical instruments. This report is
25X1 to clarify the pic-
25X1 ture regarding the graduation of the horizontal circles of the so-called THB model theodolite.

2. The horizontal circles were graduated to 20 minutes (minutes of arc), with each degree numbered. This was for those theodolites manufactured with 360 degrees to a complete circle. For those with 400 "grads" or divisions to a complete circle, the graduations corresponded in angular separation. On the vertical circle, the graduations were made to 30 minutes, with each degree numbered. The graduations were made on a circular dividing engine, of which six had been built at Zeiss, Jena previously, and all transported to Arsenal No. 1. The dividing engines were located on vibrationless piers and in a constant temperature room. If the graduations were engraved directly on the scale, the absolute width of the graduations was 1.5 microns. If they were etched, the final width was approximately three microns. The absolute error in the positioning of any graduation was plus or minus 2.5 seconds (seconds of arc).

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3. For a further subdivision of the angular spacing on the horizontal scale, there were two filar micrometer microscopes, each located at the ends of a diameter. These optically subdivided each 20 minutes of space into 1200 parts, allowing readings to be made to single seconds of arc, or, by estimation, to one-fourth second of arc. The total magnifying power of the micrometer microscopes was 60X to 70X, depending on the tube length used. On the vertical circle, readings were made to 30 degrees of arc by means of a conventional vernier. The concentricity of the axis of rotation of the telescope and the center of the horizontal scale was adjusted as close as practicable during the manufacturing; and, for the highest precision work, both micrometer microscopes were read and the results averaged to eliminate any remaining errors of non-concentricity. Ordinarily, one micrometer microscope was used.
4. The level vial attached to the vertical circle had graduations representing a movement of the bubble corresponding to 30 degrees of arc. Three leveling screws located 120 degrees apart were used.

25X1 5. [redacted]
the complete plans of the theodolite, which was being copied at Arsenal No. 1, Kiev, were discovered.

25X1 [redacted] Comments: This information seems to clear up the conflicting viewpoints. [redacted]

25X1 and provides additional information concerning the precision optical and mechanical work performed by the Zeiss, Jena, Team at Arsenal No.1, Kiev. [redacted]

25X1 [redacted] For
25X1 [redacted] there was only one micrometer microscope. Only after repeated questioning concerning the method of the elimination of errors due to the non-concentricity of the axis of rotation of the telescope and the center of the horizontal scale, did he admit the existence of two, 180-degrees-opposed, micrometer microscopes. It seems strange that provision is made in the design for the readings to be made to single seconds of arc, when the absolute error of the positioning of any graduation chosen at random is plus or minus some 2.5 seconds of arc. All in all, the instrument appears to be comparable to the more precise triangulation theodolites manufactured in the United States and elsewhere, and it apparently contains no significant new design features.

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